Symbols and abbreviations

1 Introduction

Early history. Thin-film filters.

2 Basic mathematics

Maxwell's equations and plane electromagnetic waves. The Poynting Vector. The reflectance of a simple boundary. The reflectance of a thin film. The reflectance of an assembly of thin films. Reflectance, transmittance and absorptance. Further comments on expression (2.53). The Vector method. Alternative method of calculation. Smith's method of multilayer calculation. The Smith chart. Incoherent reflection at two or more surfaces.

3 Anti-reflection coatings

Anti-reflection coating on low-index substrates—the single-layer anti-reflection coating—double-layer anti-reflection coatings—multilayer anti-reflection coatings—alternative two- and three-layer coatings. Anti-reflection coatings on highindex substrates—double-layer coatings—three-layer coatings—multi-layer coatings—inhomogeneous layers as anti-reflection coatings. Further information.

4 Neutral mirrors and beam splitters

High-reflectance mirror coatings—metallic layers—protection of metal films overall system performance, boosted reflectance—reflection coatings for the ultra-violet. Neutral beam splitters—beam splitters using metallic layers beam splitters using dielectric layers. Neutral-density filters.

5 Multilayer high-reflectance coatings

The Fabry-Perot interferometer. Multilayer dielectric coatings-all-dielectric multilayers with extended high-reflectance zones-coating uniformity requirements.

6 Edge filters

Thin-film absorption filters. Interference edge filters—the quarter-wave stack symmetrical multilayers and the Herpin index—performance calculations.

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7 Band-pass filters

Broad-band-pass filters. Narrow-band filters—the metal dielectric Fabry–Perot filter—the all-dielectric Fabry–Perot filter—the effect of varying the angle of incidence—multiple half-wave filters—induced transmission filter—phase dispersion filter. Measured filter performance.

8 Production methods and thin-film materials

The production of thin films. Measurement of the optical properties. Measurement of the mechanical properties. Toxicity. Summary of some of the properties of the common materials. The effect of conditions in the coating plant during and after deposition on the refractive indices of thin films.

9 Layer uniformity and thickness monitoring

Uniformity—spherical surface—rotating substrates. Substrate preparation. Thickness monitoring—optical-thickness tolerances—optical monitoring techniques—the quartz crystal monitor—ultrasonic method.

10 Specification of filters and environmental effects 246

Optical properties—performance specification—manufacturing specification test specification. Physical properties—abrasion resistance—adhesion—environmental resistance.

11 Applications of filters and coatings

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